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HOW TO GROW ASTERS



JAMES VICK'S SONS

ROCHESTER, NEW YORK

HOW TO GROW ASTERS

A MANUAL ON ASTERS

BY

GEORGE ARNOLD

FARM SUPERINTENDENT



SIXTH EDITION—REVISED

1912

JAMES VICK'S SONS

ASTER SPECIALISTS

ROCHESTER, NEW YORK

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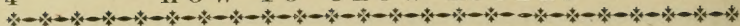
HOW TO GROW ASTERS

THE CHINA ASTER

THE ASTER was introduced into Europe from China about 1731, and is still known as the China Aster. There are many Asters native to Europe and America—mostly perennials. The seventh edition of Gray's Botany gives sixty species of Asters indigenous to the eastern United States alone. It is a curious fact that with so many true Asters in America and Europe the plant that is referred to as "the Aster" is, botanically speaking, not an Aster. It has been variously named by botanists "*Callistephus hortensis*," "*Callistephus chinensis*" and "*Callistemma hortensis*." But for everyone except the systematic botanist it is and will be known as "the Aster."

When it was first introduced it was single and the only colors were blue, violet and white. About 20 years later double flowers are mentioned in red, blue and white; and in 1807 a variegated form. An edition of Paxton's Botanical Dictionary, London, published as late as 1868, gives seven varieties of *Callistemma*, (China Aster), as being known in Great Britain at that time. The colors include blue, white, variegated and red. Paxton gives it the same brief mention that is given to Coreopsis.

About 1850 the quilled type of flower seems to have been most popular and dwarf forms of the plant also began to appear. Previous to 1890 the Aster was apparently grown largely for garden decoration, dwarf plants and small, compact flowers predominating. These types are still much in evidence in Germany—the home of the Aster seed industry. One German catalogue of five years ago (1907) offers 673 varieties divided as follows: 234 tall; 261 semi-tall; 178 dwarf.



Between 1890 and 1895 three new types were introduced which were well adapted to the uses of the commercial florist. These were Queen of the Market, Comet and Branching. American florists were quick to see the commercial value of these types and the Aster soon became an important florist's flower. It is relatively more important here than in Europe, where many of the older garden forms are still grown. With us it is the most important outdoor grown flower; and the total value of the Aster seed sold by American seedsmen exceeds that of any other one flower.

COLORS

The China Aster may now be had in colors ranging from white, and pale flesh-pink, through many intermediate shades to dark violet-blue and to deep crimson. Yellow seems foreign to the Aster and is added with difficulty. The scarlet Asters lack the admixture of yellow found in a true scarlet; and the best of the yellow Asters is not much more than a pale primrose.

Fifteen or twenty shades of color are offered by German seedsmen in some of the older and more important classes; and the addition of striped or variegated varieties sometimes brings the total to more than thirty color varieties in a single class. Asters with striped petals have not acquired much vogue in this country. While the individual flowers are sometimes quite pretty they have a somewhat blurred effect when massed. It may also be said that a large part of the two-colored flowers are imperfectly marked. In a "white and rose" for instance, there may be found on the same plant, in addition to those flowers having white petals striped with rose, some that are all rose color, some that are all white, and some in which the colors have apparently "run" into washy pink. Such shades, also, as "brownish violet," "reddish violet," "coppery purple" and "reddish lilac" are not attractive to American growers. The demand from the amateur follows rather closely the range of colors used by the florist—white, light, pink, lavender and purple, in the order named.

HOW TO GROW ASTERS

CLASSIFICATION

SOME of the European houses which supply seedsmen with Aster seed catalogue 25 to 50 classes, having from five to thirty colors in each class; about fifteen classes with from two to four colors; and fifteen to twenty separate varieties not classified. Only a few classes from this bewildering list are of interest to American growers.

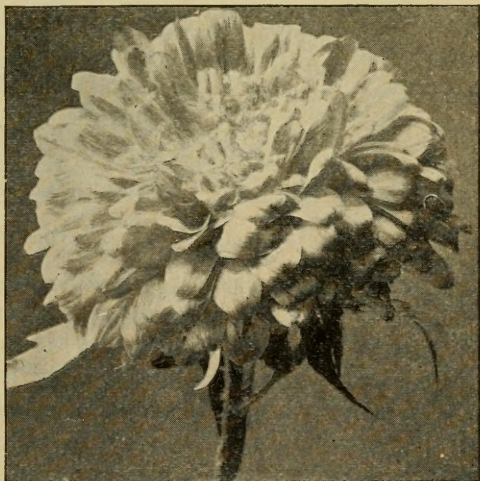
Victoria is one of the leading European types of Aster. The plant is of upright growth and medium height, blooming in mid-season. The petals of the flower are reflexed, or bent back at the ends, and the inner petals are rather short. The short, spreading petals make any defect in respect to the center of the flower very conspicuous. When perfectly double the flower has a rather formal appearance, reminding one somewhat of a double Zinnia.

Dwarf Victoria is smaller in plant and flower than the type.

Washington is a quite large flowered Victoria.

Mignon, Dwarf Mignon, Pompon, Snowball and Lady have smaller flowers of the same, imbricated, reflexed type as Victoria.

The Lady Aster is easily distinguished by its leaves, which are narrower than those of any other variety.



VICTORIA (AN INFERIOR SPECIMEN)



DAYBREAK ASTER

Daybreak and Purity, varieties resembling *Victoria* in habit and season, have been so extensively grown as to deserve special mention. They are more robust in plant and flower than *Victoria*. The flowers differ, also, in having the petals straight instead of reflexed; and in fresh flowers the petals should be slightly folded lengthwise. They were introduced by James Vick's Sons in 1897 and 1899, and several other colors have since been added to this class. New and

“Giant” strains of Daybreak and Purity, larger in plant and flower, were introduced the present year (1912).

Truffaut. (Truffaut's Peony-flowered Perfection) is another important type. Plant and season are like Victoria but the flower is quite distinct. The petals of the Truffaut Aster are broad and strongly incurved. The edges of the petal are also slightly curved forward, so that it has a boat-shaped outline.

Dwarf Truffaut, Ball or Jewel and Triumph belong to this type. Perfect flowers of this type are very pretty; but in poor or unthrifty specimens of all varieties having curved or folded petals the petals flatten out so as to lose their distinctive character.

Quilled. In a single or semi-double Aster flower the “yellow center” is made up of short tubular florets, surrounded by one or more rows of florets having the familiar long, strap-shaped corolla, or petal. One of the earliest developments was the Quilled type, in which the central tubular florets were elongated and colored like the outer, flat petals. This sort of stiff floral pincushion is but little grown at the present time.

Crown or Cocardeau is a modification of this type in which the central disk is white, surrounded by outer rays of some contrasting color.

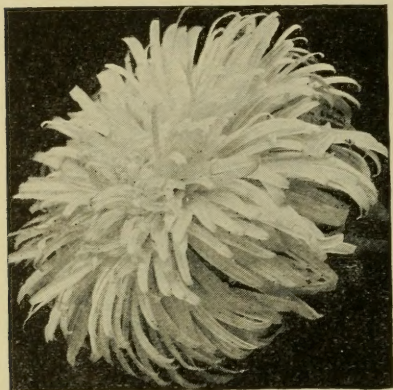
Needle. Another modification is the Needle Aster, in which all the florets are tubular, more elongated than in the quilled, and tapering to a blunt point.

Ray Asters are another form, in which the florets are all tubular. The outer rows are like darning needles; extremely long, slender and sharp pointed. As the inner florets are short the flower is flat, and of a large diameter.

Dwarf Bouquet. The plants of this type are only a few inches in height, and when in bloom form compact hemispheres of color. They were formerly much used for edging, but have been replaced by plants having more uniformity in height and a more continuous season of bloom.

COMMERCIAL TYPES

Queen of the Market. A valuable commercial class, coming into bloom two or three weeks before the mid-season varieties. The plant makes an open, spreading growth and



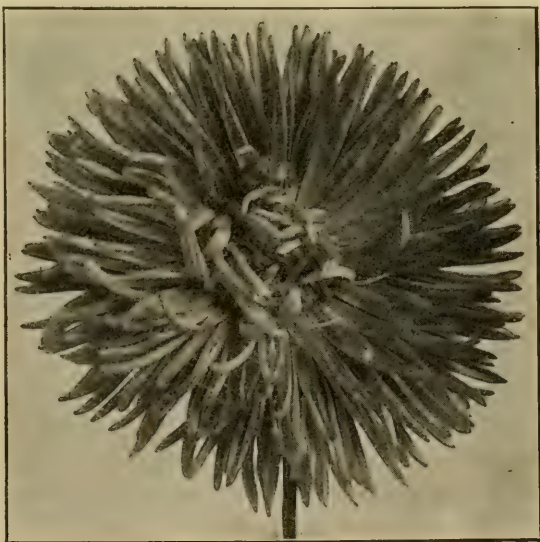
COMET ASTER, "THE ROCHESTER"

when well grown the stems are of good length. The flowers are relatively large, the petals are broad, a little recurved and longer than in most of the older types of Aster. The flower has a soft, loose appearance and the center is well covered by the inner petals. It was introduced in Europe by Vilmorin about 1885, and was generally offered in America in 1890.

Comet. The Comet type of flower is characterized by having petals that are extremely long and narrow and strongly recurved—although sometimes it is only the outer rows that are thus recurved. The original type was upright in growth with slender stems and narrow leaves. Even the seed was noticeably long and slender. Comet flowers of widely varying forms may now be had, on plants of every known type, and in season from earliest to latest. In some of the Comet varieties the center of the flower is filled with long tubular florets which are irregularly cut and slashed, giving a ragged, Chrysanthemum like effect. This is especially true on the center, or "crown" flower. In other varieties the long, narrow petals are all recurved with considerable regularity. Again, they may be curled and twisted in fantastic fashion. Originally introduced by Vilmorin at about the same time as the Queen of the Market, this graceful feathery type of flower has constantly increased in favor.

Branching. (Page 16.) The first record of the Branching Aster is the introduction of the "New White Branching," by James Vick's Sons in 1893. It was larger in plant and flower than any Aster in cultivation at that time and rapidly superseded most of the older classes. The wide spreading plants had many long, stout branches, so thickly set with laterals that disbudding was generally practised by florists. The large flowers had a soft, loose appearance, due to the irregular arrangement of the petals. The petals were quite long, rather broad, flat and nearly straight. There have been many modifications of plant and flower. Most of the stock now in cultivation is less spreading and less bushy than formerly; a race of semi-upright plants entirely devoid of laterals has been developed for florists' use; and a class of strictly upright plants with Branching flowers is being developed. Many of the Branching flowers now show strongly whorled centers. Others have the broad, incurved petal of the Truffaut type. The Semple Branching, originating with James M. Semple, Bellevue, Pa., has long petals a little folded lengthwise and also slightly whorled.

Vick's "King" Aster is another modification in which the petals are so closely folded lengthwise as to appear almost tubular. At the present time it is probable that more Branching Asters are grown in the United States than of all other kinds.



VIOLET KING

HOW TO GROW ASTERS

COMMERCIAL GROWING

THE ASTER is, at the present time, our most important outdoor commercial flower. The reasons are not far to seek. The Aster may be had in those colors which are most useful to the florist in summer; it has splendid keeping qualities as a cut flower; it has good stems; it stands rough handling as well as any flower in commercial use; and it is so easily grown that a large proportion of the flowers handled by the trade are produced by men unskilled in floriculture. Many of the Asters coming into the Rochester market are grown by farmers or by market gardeners who have not attempted the commercial growing of any other flower. Every year the production of Asters for profit is undertaken by people who not only lack experience in the special culture of flowers, but who also lack a fair knowledge of the underlying principles of the cultivation of ordinary crops and of plant growth in general.

Brief notes on the commercial growing of Asters, intended for the use of the more experienced growers, were prepared for this booklet. Since the last edition of "How to Grow Asters" was issued we have had innumerable questions from those to whom the work was apparently new. We have felt compelled, therefore, to expand these notes and make them so full that they would serve the most inexperienced beginner.

EARLY ASTERS FOR MARKET

We believe that the growing of Asters for the early market offers an excellent opportunity for profit if the work is properly done. Several growers of our acquaintance in Western New York are uniformly successful in the production of profitable crops of extra early Asters. The plants, with these growers, reach a height of two feet and upward. The large flowers are eagerly sought by the trade and bring very satisfactory prices.



BRANCHING ASTER

To produce such results one needs to understand the nature of the early varieties, and we offer some suggestions on the special treatment required by early Asters.

Plants of such early varieties as Vick's Snowdrift and Vick's Earliest Lavender, are in such a hurry to get into bloom that some care and skill are required to prevent them from blooming before a sufficient plant growth has been made. The best results are obtained by growing the plants to a good size under glass. They should be kept in a thrifty growing condition at all times. Any serious check causes the formation of flower buds and a stoppage of plant growth.

When seed is sowed outside in April or May, with that of the late Branching varieties, the little plants often set flower buds while still in the seed row. Our crop of seed of earliest varieties is grown from plants started in cold frames. Last season the seed was sowed April 8th to 11th, and the plants were planted out in a good fertile field May 24th. They were in full bloom from the 15th to the 20th of July. If one were growing flowers for home use this would be quite satisfactory. When the extra early varieties are to be grown for profit, however, we advise sowing seed in the greenhouse as early as the middle of February. They can then be planted out so that their field growth is made during the cool weather of spring. The coming of hot weather will bring them into bloom, and the growth must be made before that time.

Having a short growing season, a rich soil is much more essential to success in the field with early Asters than with the later varieties. For growing any sort of early crop it is desirable to have a heavy dressing of manure applied the previous season, and early Asters respond especially well to this treatment. If applied the same season it should be well rotted, so that it may be immediately available.

SOWING

When sowing the seed in the greenhouse the florists uses "flats," or shallow boxes three to four inches deep.

These are often made by sawing up grocery boxes; but boxes of uniform size are much more convenient and can be made so as to fit the benches and cold frames without loss of room.

See to the drainage before filling, boring holes in the corners, if necessary.

If the boards swell so that the box is water-tight the soil becomes sour and the plants sicken.

The soil need not be over two and one-half to three inches in depth, and need not be very rich.

Aster seedlings will grow in ordinary garden soil to a size large enough for the first transplanting; but it is well

to add one-fourth, fine well rotted manure, and enough sand to prevent the soil from becoming hard.

Press the soil well into the corners.

In filling a flat the center will naturally be well settled and special care should be taken to firm the corners; otherwise, after a few waterings, the corners will be low and it will be hard to keep the flat uniformly watered.

Fill the flat half or two-thirds full, water thoroughly, and finish filling with soil just moist enough to handle nicely.

The wet soil, in the bottom will furnish enough moisture so that the boxes will not have to be sprinkled until after the seed is up. A paper laid over the box will check evaporation; but it should be removed as soon as the first seeds begin to show.

Sow the seed in rows about two inches apart, cover with fine sand and press firmly.

Where the flats are uniform it is customary to use a simple marker that makes, at one operation, shallow marks, evenly spaced. It is made by tacking narrow strips on a board of suitable size and providing it with handles on the other side. Similar devices are used to space plants evenly in "pricking out", or transplanting from the seed row into other flats.

WATERING

When watering is necessary water thoroughly and evenly and do not water again until the surface is dry. *Avoid frequent sprinkling.* Do not water late in the day.

Like many other seedlings, the young aster plants, are subject to attacks of "damping off." Frequent watering is conducive to this trouble. See "Diseases of the Aster." Another objection to frequent watering is, that it tends to form a crust on the soil and thus excludes the air. Because it is porous, seeds start better in soil that does not have to be watered until after they are all sprouted. Sowing in rows, as advised above, allows one to stir the soil close to the rows. This aids in the germination of the seed and, later, in the growth of the young plants. The objection to watering late in the day is that it leaves the surface wet long enough to give fungus growths a chance to start.

TRANSPLANTING

When the seedlings have made two or more true leaves, they can be pricked off into other boxes. The soil of the plant box should be as moist as may be without sticking, so that it will not need sprinkling for the first day or two after transplanting.

Plants root better in soil that is moist than they do in soil that is wet. It is well, also, to keep the boxes of plants rather dry for a few days before pricking out, as the plants take hold better, when changed to soil more moist than that from which they are taken.

It is customary to use a rich potting soil, or compost for growing plants in the flats. We prefer, however, to use a layer of rich soil in the bottom, and an inch or so of common garden loam, or even clear sand, on top.

We find that when this is done, neglect in the care of the plant is less likely to lead to future trouble from stem-rot or other fungus diseases. The plants should have at least an inch in the row, and two and one-half inches between the rows, so that the surface of the soil may be stirred frequently. This promotes growth and prevents stem-rot. If the plants get crowded a second transplanting should be given.

When plants of the extra early varieties get crowded, or for any other reason get checked in their growth, they begin to form flower buds, and further plant growth is stopped. Keeping the plants continuously soaked with water, or allowing them to remain too dry, for several days at a time, will produce the same effect.

HARDENING

If the seed is sowed in February, the plants should be large enough to set in the field some time in April, while severe weather may still be expected. The greenhouse grown plants will be soft and tender. To harden them place the flat in a cold frame, from which the glass can be entirely removed on pleasant days. The frame will require protection from frost until the plants have been toughened by exposure.

Under favorable conditions this should not take more than ten days. Keeping the plants a little "on the dry side," for a few days, will give them a firmer texture, and full exposure to the wind, if weather conditions permit, will soon complete the hardening. We have set out plants handled in this manner, that survived a succession of hard frosts, so hard that the ground actually froze at night. The plants came through all right and made a profitable crop. Two years ago the most profitable Asters brought to this market, were from plants that were covered with six inches of snow soon after they were planted out.

CAUTION! Do not forget that when first taken from the warm greenhouse the Aster plants are as tender as so many tomato plants.

PLANTING OUT

There is usually no special skill necessary when the planting is done early in the season. The beginner, however, should be cautioned to not set plants in mud. As already stated, under "Transplanting," *plants root better in soil that is moist than they do in soil that is wet.* For convenience in cultivating, the rows need to be 27 to 30 inches apart. The plants can be set 8 to 12 inches apart in the row.

PREPARATION OF THE SOIL

Having a short growing season the preparation of the soil for a field crop of Early Asters should be thorough. Turning under coarse or strawy material that would require considerable time to decay is undesirable. We should not think of putting out plants for a crop of seed until the land was all in a fine, mellow condition to the depth that it was plowed; and we should consider careful preparation even more important in the case of plants grown for cut flowers.

FERTILIZING THE LAND

Asters, like many of our cultivated crops, do much better on soil that has been enriched previous to the year they are grown, and this is especially true of the early kinds. It is doubtful if early Asters get much benefit from manure that

is plowed under the same spring. The finest crops of field grown early Asters we have seen have been grown on land made fertile by having been used for garden crops for several years—and well fertilized each year; or that had been quite heavily fertilized the previous year. Plowing under three or



VICK'S WHITE BRANCHING

four inches of manure in the fall; or covering in early winter with an equal amount may seem to many like an extravagant preparation. We are confident, however, that the greatest profit will be found in this intensive culture. If manure is to be applied in the spring it should be well rotted and be used as a top dressing, harrowing it in after plowing.

If a commercial fertilizer is used it should be thoroughly distributed through the soil by drilling or harrowing. We think that strewing it in the row and planting over it leaves the fertilizer in a form too concentrated for best results. A high grade complete fertilizer, such as is used by market gardeners, is best for Asters. It should contain not less than three and one-half or four per cent of available nitrogen.

It has been found by experiment that much better results are obtained when the plant food is derived from organic

sources. Most dealers in fertilizers at the present time are able to supply goods of this character. If depending upon commercial fertilizers for early Asters we should use not less than 800 to 1000 pounds per acre.

CULTIVATION

We cultivate our Aster fields about once a week, when weather permits, until they begin to bloom. The first cultivations are deep and thorough. Guards are used on the cultivators so that they can be run close to the plants. As the plants increase in size the cultivation is not so deep and soil is thrown towards the plants. The last two or three times through the cultivator is set to run not over two inches deep. We think that the surface should be kept loose, but the feeding roots, which by this time fill the soil from row to row, should not be too much disturbed.

It is very important that the soil should be thoroughly stirred just as soon after each rain as it will work up mellow. There is a very rapid loss of soil moisture by evaporation when the soil is allowed to remain packed by a rain; or when a shower has formed a crust on the surface. Breaking up the crust and leaving the surface mellow also materially aids the growth of plants by admitting air to the soil.

The Asters are hoed several times during the season; partly to keep down weeds, but more particularly to keep the soil mellow between the plants in the row. Don't allow workmen to scrape the dirt away, leaving a hard, bare surface that will dry out badly and that also leaves the Aster roots exposed. A little practise will enable them to kill the weeds and still leave a loose, mellow soil in the row. A skillful use of the cultivator leaves only a very narrow strip for hand hoeing; and as the plants get larger dirt can be thrown toward the row at each cultivation, effectually smothering the weeds that are just starting.

This thorough and frequent cultivation also cleans out most of the insects in the soil.



WATERING

If artificial watering is necessary, and you have facilities for doing it, give the soil a good soaking. Nothing is gained by a mere wetting of the surface. Make sure that the water has penetrated to a depth of several inches. Then, as soon as it has settled away so that the soil will work up mellow, cultivate thoroughly, and you will hold the moisture in the soil.

If you have never made a careful examination after watering in the field you will be surprised to find that when you think you have done a thorough job of watering you have, in reality, only made a fair beginning. It takes a little over five and one-half barrels of water to make the equivalent of an inch of rainfall over a single square rod.

If one cannot put on enough water to penetrate to the roots of the plants it is perhaps better—and certainly cheaper—to conserve the moisture that is in the soil by means of a “dust mulch.” That is, checking evaporation by frequent shallow stirring of the surface.

MID-SEASON AND LATE ASTERS

To keep up a continuous supply of Asters until the end of the season, it is of course necessary to make a few successive sowings and plantings. In planning the successive crops, one should try to avoid having the flowers from a second or belated sowing of a smaller and earlier variety come on the market at the same time as the first cutting from a larger and later kind. For instance, instead of making a second sowing of the extra early varieties one can, at the time they are sowed, also sow seed of the second early or mid-season kinds. These latter would come into bloom at the same time as would a second sowing of the earliest kinds; and being larger would be preferred.

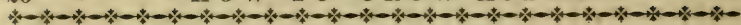
The latter part of March one can usually sow Asters in cold frames. At this season it is an advantage to put four or five inches of manure in the bottom. This will not be enough to furnish bottom heat, but it gives good drainage, and as it

decays it stimulates growth. It should be thoroughly tramped and leveled before putting on the soil so that after the dirt is leveled off there will not be spots where the soil barely covers the manure. Spots where there is only an inch or two of soil over the manure are always dry and the plants cannot be made to grow on them. Four to six inches of soil is necessary and it must be of a light nature. We use a fairly rich compost in the bottom, and on top an inch or so of light sandy loam from a garden, or clear sand from a sand bank. This reduces the liability to trouble from damping off and to subsequent trouble from stem rot. Give plenty of air in the middle of the day. Where one has a few frames or hot beds that are not fenced in, domestic animals are sometimes quite annoying when the sashes are partly opened for airing. This can be obviated by making light frames the size of the hot-bed sash and covering them with poultry netting.

The last sowing can be made in the open ground the latter part of April, providing one has a good light soil and facilities for watering. On a heavy soil one can grow strong, large plants but the roots are poor for transplanting. In a sandy or gravelly soil the plants develop a mass of fine roots; and in that kind of soil the roots do not get stripped off in digging.

The greatest volume of business in Asters is done late in the season—just before the Chrysanthemums begin to come in; and plants grown in the open ground should produce a crop of flowers in time for this market. The plants can be grown cheaper in the open ground than in boxes, or frames, and will be less subject to disease. As before stated, it is unsafe to depend upon this method unless provision is made for watering. It will be found, also, that plants in the open ground do not stand transplanting in unfavorable weather so well as those that have had their roots confined in flats or frames.

We give four inches between the rows in frames and twelve in the open ground. This allows the former to remain where sowed until large enough to plant out; and permits using the wheel hoe with the latter.



PREPARATION OF THE SOIL

We find it of great advantage to fit the land as early as possible and to keep it stirred occasionally until planted, even where we do not plant until July. Manure, stubble or refuse that is turned under has time to rot and become mingled with the surrounding soil; the moisture with which the sub-soil is filled in early spring is prevented from evaporating rapidly, as it does when the ground gets hard; and many injurious insects are ground up or brought to the surface, to make food for the birds; and weed seeds are brought to the surface, where they will sprout and then be destroyed by the next stirring. We harrow our fields as soon after each rain as the soil will work up without sticking; or whenever weeds or grass begin to show. These harrowings are usually about ten days apart.

In the case of a piece of ground not large enough to put on two-horse farm tools, a one-horse cultivator, with fine or coarse teeth, according to circumstances, would accomplish the same results.

FERTILIZING

We have advocated the use of large quantities of manure or fertilizer, for the earliest crops of Asters. The longer time the crop has in which to mature the less necessity there is for intensive culture.

For the last crop of Late Branching Asters quite satisfactory growths can be produced on land of only moderate fertility, provided it is well supplied with moisture. But in a dry season the soil that has had liberal dressings of stable manure will show far stronger growth. We consider the use of fresh horse manure undesirable. We have observed cases where the Aster plants showed a considerable percentage of fungus diseases as far as fresh horse manure had been used in the field.

ROTATION

Growers are usually advised to change the location of their Asters from year to year, so that they will always be planted on fresh ground. In a general way this is undoubt-

edly desirable. It has a tendency to prevent the soil from getting badly infested with diseases or insects that attack the Aster. If the soil becomes infested with root-lice it is unsafe to plant Asters on it the following year. Where there has been a severe attack of any fungus disease, especially stem-rot, there is greater liability of infection the following year on the same ground. On the other hand, if a piece of ground is especially well adapted to the growth of the Aster, it would be unwise to change to a poorer piece, merely for the sake of a change. We have known of Asters being grown on the same plot twenty years in succession, and the last crop was the best. On one farm in this county, last year, where Asters were planted in several widely separated fields there was less disease in a field on which Asters had been planted continuously for six years than there was in poorer fields on which Asters had not previously been grown.

To sum up; so long as Asters continue to do well on a particular plot it is not necessary or advisable to move them unless one can be sure of equally good conditions elsewhere.

COVER CROPS

When the same land is used continuously for Asters we like to use a cover crop for the purpose of keeping up the supply of humus or vegetable mold in the soil. Rye or Vetch sowed at the rate of one and one-half bushels per acre are used for this purpose.

The Vetch is preferable if it can be sowed early—say by the first of September. Being a leguminous plant it enriches the soil by the addition of valuable nitrogen drawn from the air. The species used for this purpose is *Vicia villosa*. It is variously known as "Hairy Vetch," "Hardy Vetch," "Winter Vetch," "Russian Vetch" and "Sand Vetch." The "Spring Vetch," *Vicia sativa*, is not hardy in the north. The Winter Vetch is a slender pea-like vine, with narrow leaflets and one-sided racemes of small violet-blue flowers. It is a vigorous plant, making a growth of five or six feet when it has a full season in good soil. Sowed late in the season it covers the ground with a close mat of green.

Winter Rye is one of the hardiest of plants and will grow late in the fall and early in the spring, and will survive the hardest winter. Sowed late in October it will still furnish a fair amount of green growth to turn under the following May.

It is necessary to plow the cover crop under before it gets too large or too mature. Turned under while still succulent, and when the ground is moist, it will decay in a few days. After the plants have begun to harden, and especially if turned under when the ground is dry, they decay slowly and further dry out the soil in the process. The prompt and repeated use of the roller and harrow are essential to hasten the decay of the plant growth that has been turned under and to solidify the soil.

If we wish to get the full benefit of a cover crop we want it to make a good growth in the spring, so that only late varieties of Asters can follow a cover crop.

A cheaper grade of fertilizer, one containing less nitrogen, is effective on crops that stand over winter. On our cover crops we have used the dissolved phosphate rock—"acid rock," or "dissolved bone," as it is called. This material contains about $14\frac{1}{2}$ per cent. phosphoric acid and costs about \$15.00 per ton. On our soil 400 to 600 pounds per acre of this fertilizer drilled in with the seed materially increases the growth of the cover crop and is a cheap method of keeping up the fertility of the soil.

PLANTING OUT

When there is a large block of Asters to plant one can not always wait for showery days. The plants are soon ruined if they are left in a crowded seed row after they have reached a size suitable for planting out. So it sometimes happens that late plantings of Asters have to be made when the weather conditions are very unfavorable.

The Aster plant will not endure so much hardship in transplanting as some of the vegetable plants with which we are all familiar. The thin and comparatively soft leaves burn much more easily than the thick, hard leaves of the cabbage ;

and new feeding roots do not start so quickly as they do on the tomato.

When planting during hot, dry weather we always "puddle" the Aster roots. A very thin mortar of clay is prepared. Grasping a large handful of plants by the top, the roots are thoroughly immersed in the "puddle" and then wiped back and forth over fine, loose earth. The drier soil clings to the wet clay, effectually coating over the bundle of wet roots, excluding air and keeping them in good condition. When several handfuls have been prepared in this way they are rolled up in a wet burlap and in this shape can be carried to a distant field or kept for planting several hours later. Clay, not ordinary loamy top soil should be used for making a "puddle."

When weather conditions are very trying we do all of the planting in the afternoon. Asters planted in the morning when it is so very hot and dry get so badly parched before sundown that they do not recover over night and are liable to be burned to a crisp by the end of the second day. Whereas, if planted in the afternoon they do not get so badly wilted but that they will freshen up by next morning, and so stand a good chance to pull through.

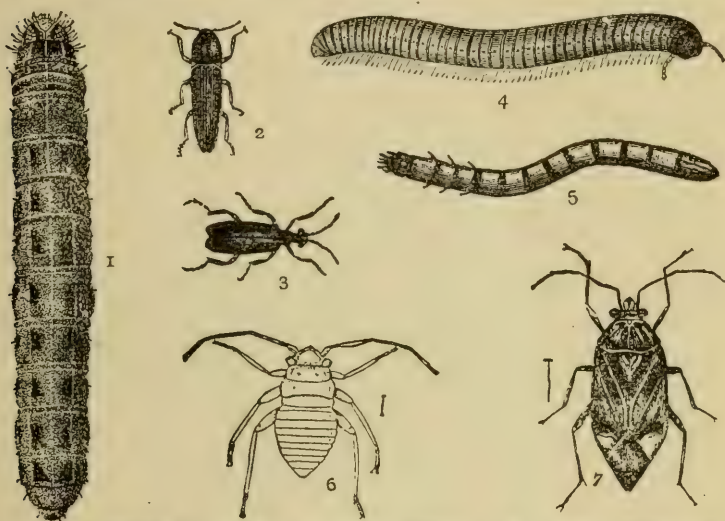
In planting by hand in a dry time great care is necessary to prevent dry earth from rattling into the hole made by the dibble, and so coming into direct contact with the roots. Plants seldom live when this is allowed to happen. One can often brush away the dry earth with a stroke of the dibble before making the hole; but when the soil is dry and too deep for this it is better to water the row before planting. A good method is to make, on the mark, a shallow furrow with hoe or hand plow and then water this furrow an hour in advance of planting. After planting pull dry earth over the furrow to prevent baking and too rapid evaporation. This method of watering in the plants if done late in the day, will carry them safely through the most trying weather. Putting water on top after planting does not give good results.

INSECT ENEMIES

The Tarnished Plant-bug, *Lygus pratensis*, does a lot of mischief that is frequently attributed to other causes, even by some experienced growers. Plants upon which these bugs have been feeding have a characteristic appearance that, once known, is easily recognized. The bugs live by sucking the sap from the tender tips of the plants and pay for their dinners by causing the tips to die. This sort of "pinching back" produces a dwarfed, bunched, thickened appearance, as distinguished from the symmetrical dwarfing that is caused by lack of moisture. An extreme case is shown on page 27. Three terminal buds have escaped for the time being and are making a normal growth. Another extreme case is shown on page 29. One of the lower branches on this plant made a normal growth until it had exceeded the stunted portion in height. Then the terminal bud on this branch was killed and two lateral buds near the end started a healthy growth, as seen in the upper right hand corner of the picture. In dry weather the damage seems more marked. Often the branches become distorted and the leaves thick and yellow. Occasionally plants are actually destroyed, only the stump and a few blackened leaves remaining. The plant pictured on page 31, was from the top of a poor gravelly knoll, and was found in the condition shown at the end of a long drought. A number of composite plants are affected in like manner. Dahlias are especially susceptible. Among others we have noted, in our trial grounds, *Brachycome*, *Calendula*, *Centaurea Cyanus*, and *C. Moschata*, and most of the Everlastings, especially *Acroclinium* and *Helichrysum*; and *Tagetes*, especially *T. erecta*. Among the non-composite flowers *Antirrhinum* and *Salvia* are especially susceptible to plant-bug injury.

The tarnished plant-bug is an inconspicuous, yellowish-brown bug, a little smaller than a house fly, page 25, figs. 6 and 7. As one approaches the plant on which the bugs are feeding they either hide on the opposite side or fly away. As

they are of an inconspicuous color they readily escape notice. The fields and hedges are full of them, so that killing off today's quota would be no insurance against tomorrow. Being a sucking insect, poisoning the plant gives no relief. Any sort of spray, even a simple dusting of air slacked lime,



1. CUT-WORM, twice life size. 2. CLICK-BEETLE, life size. 3. PENNSYLVANIA BLISTER-BEETLE, life size. 4. MILLIPEDE, twice life size. 5. WIRE-WORM, twice life size. 6 and 7. TARNISHED PLANT-BUGS, immature and adult forms. Natural size indicated by line at side.

seems to make the plant less attractive to the bugs. A spraying of whale oil soap has proved one of the most effectual of the various deterrents we have tried. Kerosene emulsion is also excellent. As above noted, the most damage is done in dry weather. For one thing, the bugs are more active on hot, sunny days; also, when the plants are making a fresh, vigorous growth they seem to overcome the poison to a great extent. In our extensive field cultures we try to conserve soil moisture so as to keep up a thrifty growth, and take a chance on the bugs. They do not work in the shade; so if one has an orchard or other shady place that is avail-

able, he can escape this pest. Some of the best flowers of Branching Asters received at the Wholesale Florist's in Rochester last season were sent in by a lad living near our seed farm. Upon investigation we found that the long stemmed flowers were grown on a little plot of four square rods, surrounded by old apple trees. We should not be surprised if growers in many sections would find it profitable to grow late Asters under cheese cloth, as Connecticut farmers do tobacco. In some places they do not appear to have discovered the cultivated Asters; but all of the Tarnished Plant-bugs around Rochester seem to have acquired that perverted taste.

The Pennsylvania Blister-beetle, *Epicauta pennsylvanica*, feeds upon the flowers of the Aster and is exceedingly troublesome throughout its range. Page 25, fig. 3. It seems to be most prevalent in Pennsylvania and New Jersey, and is occasionally found as far north as Central New York. It is a good sized beetle, its rather soft body being a half-inch or more in length. It is of a uniform black color. Being active insects with voracious appetites, when a swarm of them attack a field of Asters they soon ruin all the flowers showing color. Good success has been reported combatting them with a spray containing three pounds of arsenate of lead in fifty gallons of water.

The natural food of this species is said to be the pollen of the Goldenrod. It is to be hoped that the other two hundred species of Blister-beetles found in the United States will not transfer their attentions to the cultivated Aster. From the dried and ground bodies of the European species, the "Spanish-fly," or Cantharides, a blister powder is made; and American species contain the same blistering property.

Cut-worms are the caterpillars of certain moths known as Owlet-moths. Most of the moths or "millers" that fly into our houses at night belong to this family. There are in this state at least thirty species known to produce destructive cut-worms.



Aster plant badly dwarfed by Tarnished Plant-bug. Three branches have escaped injury and making normal growth.

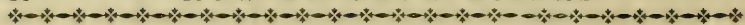
The Cut-worms are smooth, soft bodied, fat-looking caterpillars. Page 25, fig. 1. When full grown they range from one inch to almost two inches in length, and in color from a dingy gray to almost black. The commonest kinds, as usually found, are a rather dark green and an inch or less in length. They feed at night, cutting off young plants near the surface of the ground and sometimes girdling larger plants. They eat anything that is tender and succulent. During the day they can generally be found just under the surface of the ground near where they last fed, burrowing down to moist soil. They may be destroyed by the use of poisoned bait. On a large scale, clover or other succulent plants are sprayed with Paris green, mowed, and scattered over the field in small bunches, late in the day. Poisoned bran is equally effective.

Wire-worms are the young of click-beetles or "snapping-bugs," as they are commonly called, of which there are more than five hundred kinds in North America. Page 25, fig. 2. The larvae are slender worm-like creatures, brownish or yellowish white in color, and have a very hard covering. Page 25, fig. 5. They are sometimes confused with the millipedes, or "thousand-legged worms." Page 25, fig. 4.

Millipedes feed on decaying vegetable matter and are not thought to be at all harmful. Wire-worms feed upon the tender roots of plants and take anything that comes in their way. No successful means of poisoning them has been found, either by means of poisoned bait or by putting some substance on the soil to kill the wire-worms. Salt, potash, lime and similar substances can not be put on the ground in quantity sufficient to kill the wire-worms without destroying the growing crop. Fall plowing, including a thorough stirring and pulverizing of the soil, is the best means, so far found, of ridding a field of wire-worms. They are seldom found in serious numbers in land that is under cultivation every year.



Aster plant dwarfed by Tarnished Plant-bug. One lower branch escaped injury until it exceeded the main stem in height. Then the terminal bud on this branch was killed and two lateral buds near the end developed a normal growth.



White Grubs are the larvae or immature forms of many kinds of May-beetles or June-bugs. They are too well known to need any description. Like the wire-worms they accumulate in grass lands, but are not usually serious in land plowed every year. Fall plowing and thorough cultivation will destroy most of them. If not disturbed the white grub will frequently follow along a row eating off the roots and destroying one plant after another. By digging about a plant on the first indication of wilting the intruder can usually be found and killed.

Cut Worms, Wire Worms and White Grubs can be kept out of late plantings of Asters by the treatment recommended for putting the soil in good condition; namely, early plowing and frequent harrowing until planting time. The pests are eventually cleaned out in this way. For early Asters, that have to be planted as soon as the ground is plowed, one should select a place that had clean tillage the previous year. Ground that is weedy or grassy is likely to be infested. In one case coming under our notice, where a block of early Asters was set on freshly plowed clover sod, one-third of the plants were eaten by cut-worms the first night; the remainder of the plants were saved by replanting in another place. Thorough and frequent tillage will frequently get rid of wire-worms and cut-worms. Cultivating close to the plants and hoeing between them at frequent intervals gets the worms worked out of the soil. The white grubs are not easily reached by the hoe, and when one gets started in a row, it will eat the roots off one plant after another until the grub has been captured.

The Red-headed Flea-beetle, *Systema frontalis*, is less than a quarter of an inch long, with the wing covers distinctively striped lengthwise, somewhat resembling the striped cucumber beetle. As its name would indicate, it is a very lively insect. It does not usually appear in serious numbers until late summer, when it ruins the blooms for cutting by eating pits in the green bracts surrounding the flowers. One year



Aster plant in dry ground dying from attacks of Tarnished Plant-bugs. Part of the leaves were black and crisp.

it attacked the newly set plants in considerable numbers, riddling the few leaves, so that we were compelled to spray thirty acres of Asters to save them. Arsenate of lead proved an effective remedy, applied at the customary strength.

The Striped Cucumber-beetle, too well known to need description, is sometimes found in destructive numbers, eating the petals of Asters and disfiguring them for market. It may be controlled by the use of arsenate of lead.

Root Lice cause the plants to have a wilted, sickly, stunted appearance. Upon pulling up the affected plants the roots will be found to be covered with bluish lice. A mulch of tobacco stems, or tobacco dust applied early in the season will prevent attacks. Saturating the soil about the roots of affected plants with freshly made tobacco water will destroy the lice. This may be prepared by pouring boiling water over tobacco stems, or tobacco dust, and leaving it in a closed vessel for a few hours.

As root lice live over winter in the soil it is not safe to plant Asters the following year on land where they have appeared.

DISEASES OF THE ASTER

Yellows. The yellow disease of the Aster is characterized by a pale yellowish green color and a spindling growth. The entire plant shown on page 33 had a pale, bleached color which is not shown in the picture. The growth was more upright and more slender than that of neighboring healthy plants. In extreme cases the plants have a bleached look and the flowers are pale green or white. The corollas of the florets are long, and appear tubular instead of flat, as shown on page 35. It frequently affects a part of the plant, often dividing on the branch so that one-half of the terminal flower will be a sickly green and the other half a normal color. The plant shown on page 37 was attacked by the yellows after normal growth had started. The large leaves were normal size and a dark healthy green in color. The new growth starting from the axils of these leaves was very



Aster plant with yellow disease. Entire plant pale greenish yellow, and a spindling growth slender and a pale greenish yellow in color, like the heart of a celery plant. In this case we suspect that growth was first checked by plant-bug injury. The disease is apparently brought on by an irregularity in the moisture supply and rarely appears under glass, or under any circumstances where moisture conditions are under complete control. In field culture early plowing and frequent cultivation will conserve the soil moisture and produce conditions so nearly uniform that the losses from yellows are usually not serious.

On the other hand we have had letters from amateurs having several hundred plants, nearly all rendered worthless by this sort of bilious attack.

In small plantings where the yellow disease has been prevalent, and where thorough cultivation is not practicable, we would suggest a trial of mulching for the purpose of keeping a more uniform condition of soil moisture. Because of growing under similar conditions several plants in the same row are sometime affected, one after another, in such a way as to lead to the belief that the disease is spreading from plant to plant.

Investigations made at the Massachusetts Agricultural College, some years ago, extending over a period of several years, demonstrated that the disease is not caused by any organism, either fungus or bacterium; and it is not communicated from one plant to another.

It is not carried over in the seed; nor is it in any way caused by poor or weak seed. The strongest Aster plants are quite as liable to disease as the weak ones; and a disease having the same appearance is prevalent among some of our common roadside weeds.

The peculiar appearance of the diseased Aster plants is the result of a sort of indigestion in the plant; and that, in turn, seems to be caused by some irregularity in the supply of soil moisture.

Damping off before the first transplanting and *stem rot* in the field, troubles arising from similar causes, sometimes take a heavy toll, especially in early varieties. They may be classed as preventable diseases. Understanding the nature of the diseases and using proper precautions we can escape serious loss. It is well known that damping off is caused by a microscopic fungus eating off the stem of the little seedling. Three factors that favor the growth of this fungus are; first, the presence of decaying organic matter; second, a continuously moist condition; third, absence of sunlight. Ordinary potting soil, full of organic matter, is a good breed-



Abortive Aster flower on plant with yellow disease. Florets tubular, and pale green.

ing ground for fungi. When sowing Aster seed in flats or frames, if we cover the soil with a half inch or more of sterile sand we very largely cut out the first factor. We can get around the second factor by making the intervals between watering as long as possible. This is facilitated by the sand which acts as a mulch to the layer of soil below. It is a decided advantage to have the surface dry, if the soil in which the roots are feeding is reasonably moist; but it takes some self restraint for the beginner to refrain from using a

hose whenever he can find a dry spot. We cannot control sunlight; but we can give the plants a better show by sowing the seeds in rows. This admits light and air to the stems and permits frequent stirring of the surface.

Stem-Rot. When in doubt, examine for stem-rot. In the final stage of the disease the outside of stem is black and decayed about the base; sometimes the outer covering is green, but the inner layer is dead, and black streaks run through the center of the stems. In either case the damage is done by a fungus growth which eventually girdles the plant and causes it to wilt and die. As a rule, it does not show much in the field until about the time the plants begin to bloom, but in most cases the plants were infected while still in the flat or seed bed. A neighbor who grows several acres of Asters for seed raises his plants in frames. At one time he had heavy losses from stem-rot. He has practically controlled the trouble by using soil from a sand bank, enriched with phosphate in place of manure. If there are low spots in the field, not well drained, stem-rot is liable to develop during continued wet weather. When the trouble has appeared it is too late to apply remedies, and, as in the case of damping off, one can only suggest the proverbial "ounce of prevention." If there are facilities for watering in the field, soak the ground to a depth of several inches and stir the soil as soon as it will work up mellow. Constant light surface watering is wasteful of time and water and is conducive to stem-rot. Good success under glass has been reported from the use of air slacked lime, in connection with keeping the plants and the surface of the benches free from decaying leaves. The spores of the fungus that causes stem-rot appear to be carried over from year to year in greenhouses and cold frames. In cases where there has been much loss from this trouble it would be well to thoroughly spray with a one per cent solution of formaldehyde before again using for the growing of Aster plants.



Aster plant affected with yellow disease late in season. Large leaves normal size and color; new growths slender, and pale greenish yellow.

Stem-rot seldom appears in plants that are grown in the open ground. In fact we have never known a case of serious loss in fields planted from outdoor grown plants, except in low, wet spots.

Rust. The "orange rust," characterized by conspicuous orange colored pustules on the under side of the leaves, sometimes becomes a serious trouble. We believe that it gains much headway only where the plants have been checked in their growth by other causes. Spraying thoroughly, so as to cover the underside of the leaves with a fungicide, will hold the rust in check.

Blight. A disease bearing a superficial resemblance to the "early blight" of potatoes has been noted in a few fields in this county. We do not know that this trouble is prevalent elsewhere. It would appear to be carried over in the soil as it has appeared in the same fields three years in succession. So far as we know it has not been identified.

MISCELLANEOUS HINTS

For the Amateur's Garden. The easiest way to grow Aster plants is to sow the seed in rows in the vegetable garden or in a flower bed. If this is done in April or early May, as soon as the ground can be worked nicely, the plants will come along in time for a full crop of flowers. It is difficult to grow Aster plants in a dwelling house. They need full light and do best at a temperature of about 55°, running up to 70° in sunlight.

When planting Asters in beds in the flower garden those having an upright growth, and most of the mid-season varieties, may be planted 8 to 10 inches apart each way. The large Branching kinds 15 to 18 inches each way.

Flowers for Exhibition. Pinch out the center bud when the plants are six to eight inches in height. Allow from three to five branches to start and keep the side buds pinched on these. When the plants are large enough to permit, mulch them with three or four inches of partly decayed

manure, and keep them well watered with weak manure water. If cut before fully opened the flowers may be held for ten or more days by standing in a cool cellar with the stems in water. In hot weather better flowers can be had if cut when a third open and allowed to open slowly in a light cellar. When putting Asters in vases any leaves that would be under water should be stripped from the stems, as they become offensive in a short time.

If the flowers are to be sent to a distance pack in small bunches with wet paper around the stems and soft, dry paper about each bunch of flowers. Use plenty of paper in packing and be sure that the flowers will not shuck in the package. Have flowers and all materials as cool as possible when packed. It is better, if possible, to ship at night, so that the flowers are travelling while it is cool.

Amount of Seed. It may be of interest to know that an ounce of Aster seed contains about ten to twelve thousand seeds. After making liberal allowances for injury and destruction of young plants in planting, etc., one ought to grow five thousand mature plants from one ounce of seed. On a large scale we allow six ounces of seed to the acre of plants, or about three thousand plants to the ounce of seed.

INSECTICIDES

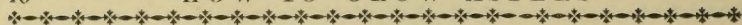
POISONS FOR INSECTS THAT EAT THE PLANTS

PARIS GREEN. Use as for potatoes, etc. One pound to 150 gallons of water.

SCHEELE'S GREEN. Used as Paris green. Remains in suspension better.

ARSENATE OF LEAD. Probably the safest and best of the mineral poisons. Used only in spray. Six pounds Arsenate of Lead paste and 100 gallons of water.

HELLEBORE. Preferred to the mineral poisons for use in a small way. May be used dry, diluted with five parts of flour or air-slacked lime. Apply with a bellows. As a spray, one ounce to three gallons of water.



CONTACT REMEDIES

FOR SOFT-BODIED INSECTS AND THOSE WITH SUCKING MOUTH PARTS (PLANT LICE AND BUGS)

WHALE OIL SOAP. Dissolve one pound in hot water and dilute to seven gallons.

PYRETHRUM. Dry, with two parts of flour. Apply with a bellows. As a spray one ounce to three gallons of water.

TOBACCO DUST—TOBACCO STEMS. The dust is an excellent remedy for plant lice. For a spray, steep one pound of stems in two gallons of water. *Use while fresh.*

“BLACK LEAF 40” is the best form in which the active principle of tobacco is prepared for outdoor use. Dilute with water, as directed. Keeps indefinitely.

FUNGICIDES

BORDEAUX MIXTURE :

Blue Vitrol.....	5 pounds.
Fresh Lime.....	5 pounds.
Water.....	50 gallons.

Dissolve the vitriol by suspending it in water over night in a coarse sack. Use a wooden or earthen vessel. Slake the lime separately. Dilute each solution before mixing and strain before using. Do not mix the solutions together until wanted for use ; or may be procured already prepared.

AMMONIACAL COPPER CARBONATE AND SOAP :

Copper Carbonate.....	6 ounces
Ammonia (26°).....	3 ounces.
Soap.....	1 pound.
Water.....	50 gallons.

Dissolve the copper carbonate in the ammonia, somewhat diluted with water, using no more ammonia than is necessary barely to dissolve the copper carbonate. Put this into 40 gallons of water. Dissolve the soap and add to the solution. May be kept indefinitely if kept in stoppered bottles. Does not discolor the foliage like Bordeaux Mixture.

We can furnish any of the Insecticides or Fungicides here mentioned.

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